DOCUMENT RESUME

ED 448 443 CS 217 306

AUTHOR Panitz, Theodore
TITLE Collaborative versus Cooperative Learning: A Comparison of the Two Concepts Which Will Help Us Understand the Underlying Nature of Interactive Learning.
PUB DATE 1999-12-00
NOTE 13p.
AVAILABLE FROM For full text: http://www.capecod.net/~TPanitz/Tedspage.
PUB TYPE Opinion Papers (120)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Active Learning; *Classroom Techniques; Community Colleges; *Cooperative Learning; Instructional Effectiveness; Instructional Innovation; Learner Controlled Instruction; *Learning Strategies; Student Participation; *Teaching Methods; Two Year Colleges
IDENTIFIERS *Collaborative Learning

ABSTRACT

This paper clarifies the differences between collaborative and cooperative learning by presenting the author's definitions of the two terms, reviewing those of other authors who have helped clarify his thinking, and presenting and analyzing the educational benefits of collaborative/cooperative learning techniques. It states that collaborative learning (CL) is a personal philosophy, not just a classroom technique. The underlying premise of collaborative learning is based upon consensus building through cooperation by group members, in contrast to competition in which individuals best other group members. Cooperative learning is defined by a set of processes which help people interact together in order to accomplish a specific goal or develop an end product that is usually content specific. It is more directive than a collaborative system of governance and closely controlled by the teacher. While there are many mechanisms for group analysis and introspection, the fundamental approach is teacher centered, whereas collaborative learning is more student centered. The paper presents questions teachers ask from cooperative and collaborative learning perspectives. It then discusses options in cooperative learning by presenting a table that displays a number of issues in education: student-centered/teacher-centered; intrinsic/extrinsic motivation; knowledge construction/knowledge transmission; and loose, "trusting-students-to-do"/"structure-it-right: social engineering." The paper concludes with a discussion of the implications of these issues. Contains 12 references. (RS)

Reproductions supplied by EDRS are the best that can be made
from the original document.

ED 448 443

COLLABORATIVE VERSUS COOPERATIVE LEARNING--A COMPARISON OF THE TWO CONCEPTS

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

CS 217 306

BEST COPY AVAILABLE

COLLABORATIVE VERSUS COOPERATIVE LEARNING- A COMPARISON OF THE TWO CONCEPTS WHICH WILL HELP US UNDERSTAND THE UNDERLYING NATURE OF INTERACTIVE LEARNING

By Ted Panitz

I have been searching for many years for the Holy Grail of interactive learning, a distinction between collaborative and cooperative learning definitions. I am getting closer to my elusive goal all the time. I believe confusion arises when people look at processes associated with each concept and see a certain amount of overlap or inter-concept usage. I will clarify the definitions of collaborative and cooperative learning first by presenting my definitions of the two terms and reviewing those of other authors who have helped clarify my thinking and second by presenting and analyzing the educational benefits of collaborative/cooperative learning techniques.

The underlying premise for collaborative and cooperative learning is founded in constructivist epistemology. Johnson, Johnson & Smith (1991) have summarized these principles in their definition of a new paradigm of teaching. " First, knowledge is constructed, discovered, and transformed by students. Faculty create the conditions within which students can construct meaning from the material studied by processing it through existing cognitive structures and then retaining it in long-term memory where it remains open to further processing and possible reconstruction. Second, students actively construct their own knowledge. Learning is conceived of as something a learner does, not something that is done to the learner. Students do not passively accept knowledge from the teacher or curriculum. Students activate their existing cognitive structures or construct new ones to subsume the new input. Third, faculty effort is aimed at developing students' competencies and talents. Fourth, education is a personal transaction among students and between the faculty and students as they work together. Fifth, all of the above can only take place within a cooperative context. Sixth, teaching is assumed to be a complex application of theory and research that requires considerable teacher training and continuous refinement of skills and procedures" (p1:6)

The following will serve as a starting point for this discussion. A basic definition of the terms collaborative and cooperative, reduced to their simplest terms, is presented:

Collaboration is a philosophy of interaction and personal lifestyle where individuals are responsible for their actions, including learning and respect the abilities and contributions of their peers;

Cooperation is a structure of interaction designed to facilitate the accomplishment of a specific end product or goal through people working together in groups.

Collaborative learning (CL) is a personal philosophy, not just a classroom technique. In all situations where people come together in groups, it suggests a way of dealing with

people which respects and highlights individual group members' abilities and contributions. There is a sharing of authority and acceptance of responsibility among group members for the groups actions. The underlying premise of collaborative learning is based upon consensus building through cooperation by group members, in contrast to competition in which individuals best other group members. CL practitioners apply this philosophy in the classroom, at committee meetings, with community groups, within their families and generally as a way of living with and dealing with other people.

Ken Bruffee (1995) identifies two causes for the differences between the two approaches. He states: "First, collaborative and cooperative learning were developed originally for educating people of different ages, experience and levels of mastery of the craft of interdependence. Second, when using one method or the other method, teachers tend to make different assumptions about the nature and authority of knowledge." (p12) These different assumptions will be explored throughout the paper. The age or education levels as a distinction have become blurred over time as practitioners at all levels mix the two approaches. However, what determines which approach is used does depend upon the sophistication level of the students involved, with collaborative requiring more advanced student preparation working in groups. Other determining factors are the philosophy and preparation of the teacher.

Brufee sees education as a reacculturation process through constructive conversation. Students learn about the culture of the society they wish to join by developing the appropriate vocabulary of that society and by exploring that society's culture and norms (i.e. that of mathematician, historian, journalist, etc.). Brufee identifies two types of knowledge as a basis for choosing an approach. Foundational knowledge is the basic knowledge represented by socially justified beliefs we all agree on. Correct spelling and grammar, mathematics procedures, history facts, a knowledge of the contents of the constitution, etc., would represent types of foundational knowledge. Brufee contends that these are best learned using cooperative learning structures in the early grades. He states: "The main purpose of primary school education is to help children renegotiate their membership in the local culture of family life and help them join some of the established knowledge communities available to them and encompassing the culture we hold in common. An important purpose of college or university education is to help adolescents and adults join some more of the established knowledge communities available to them. But another, and perhaps more important pirpose of college or university education is to help students renogotiate their membership in the encompassing common culture that until then has circumscribed their lives." (p15)

Brufee defines nonfoundational knowledge as that which is derived through reasoning and questioning versus rote memory. He writes: "It is more likely to address questions with dubious or ambiguous answers, answers that require well-developed judgment to arrive at, judgment that learning to answer such a question tends, in turn, to devlop." (p15) The other way in which nonfoundational education differs from foundational is that it encourages students not to take their teacher's authority for granted. Students should doubt answers and methods for arriving at answers provided by their professors, and perhaps more importantly they need to be helped to come to terms with their doubts

by participating actively in the learning and inquiry process. Out of this process knew knowledge is often created, something not likely to occur when dealing with the facts and information associated with foundational knowledge. Collaborative learning shifts the responsibility for learning away from the teacher as expert to the student, and perhaps teacher, as learner. Brufee sees the two approaches as somewhat linear with collaborative learning being designed to pick up where cooperative learning leaves off. In effect, students learn basic information and processes for interacting socially in the primary grades and then extend their critical thinking and reasoning skills and understanding of social interactions as they become more involved and take control of the learning process through collaborative activities. This writer believes that the transition is better viewed as a continuim from a closely controlled, teacher-centered system to a student-centered system where the teacher and students share authority and control of learning.

Cooperative learning is defined by a set of processes which help people interact together in order to accomplish a specific goal or develop an end product which is usually content specific. It is more directive than a collaborative system of governance and closely controlled by the teacher. While there are many mechanisms for group analysis and introspection the fundamental approach is teacher centered whereas collaborative learning is more student centered.

Spencer Kagan (1989) provides an excellent definition of cooperative learning by looking at general structures which can be applied to any situation. His definition provides an umbrella for the work cooperative learning specialists including the Johnsons, Slavin, Cooper, Graves and Graves, Millis, etc. It follows: "The structural approach to cooperative learning is based on the creation, analysis and systematic application of structures, or content-free ways of organizing social interaction in the classroom. Structures usually involve a series of steps, with proscribed behavior at each step. An important cornerstone of the approach is the distinction between "structures" and "activities". To illustrate, teachers can design many excellent cooperative activities, such as making a team mural or a quilt. Such activities almost always have a specific content-bound objective and thus cannot be used to deliver a range of academic content. Structures may be used repeatedly with almost any subject matter, at a wide range of grade levels and at various points in a lesson plan."

John Myers points out that the dictionary definitions of "collaboration", derived from its Latin root, focus on the process of working together; the root word for "cooperation" stresses the product of such work. Co-operative learning has largely American roots from the philosophical writings of John Dewey stressing the social nature of learning and the work on group dynamics by Kurt Lewin. Collaborative learning has British roots, based on the work of English teachers exploring ways to help students respond to literature by taking a more active role in their own learning. The cooperative learning tradition tends to use quantitative methods which look at achievement: i.e., the product of learning. The collaborative tradition takes a more qualitative approach, analyzing student talk in response to a piece of literature or a primary source in history. Myers points out some differences between the two concepts: "Supporters of co-operative

learning tend to be more teacher-centered, for example when forming heterogeneous groups, structuring positive inter-dependence, and teaching co-operative skills. Collaborative learning advocates distrust structure and allow students more say if forming friendship and interest groups. Student talk is stressed as a means for working things out. Discovery and contextual approaches are used to teach interpersonal skills. Such differences can lead to disagreements.... I contend the dispute is not about research, but more about the morality of what should happen in the schools. Beliefs as to what should happen in the schools can be viewed as a continuum of orientations toward curriculum from "transmission" to "transaction" to "transmission". At one end is the transmission position. As the name suggests, the aim of this orientation is to transmit knowledge to students in the form of facts, skills and values. The transformation position at the other end of the continuum stresses personal and social change in which the person is said to be interrelated with the environment rather than having control over it. The aim of this orientation is self-actualization, personal or organizational change."

Rocky Rockwood describes the differences by acknowledging the parallels they both have in that they both use groups, both assign specific tasks, and both have the groups share and compare their procedures and conclusions in plenary class sessions. The major difference lies in the fact that cooperative deals exclusively with traditional (canonical) knowledge while collaborative ties into the social constructivist movement, asserting that both knowledge and authority of knowledge have changed dramatically in the last century. Rockwood states: "In the ideal collaborative environment, the authority for testing and determining the appropriateness of the group product rests with, first, the small group, second, the plenary group (the whole class) and finally (but always understood to be subject to challenge and revision) the requisite knowledge community (i.e. the discipline: geography, history, biology etc.) The concept of non-foundational knowledge challenges not only the product acquired, but also the process employed in the acquisition of foundational knowledge. Most importantly, in cooperative, the authority remains with the instructor, who retains ownership of the task, which involves either a closed or a closable (that is to say foundational) problem (the instructor knows or can predict the answer). In collaborative, the instructor--once the task is set-- transfers all authority to the group. In the ideal, the group's task is always open ended. Seen from this perspective, cooperative does not empower students. It employs them to serve the instructor's ends and produces a "right" or acceptable answer. Collaborative does truly empower and braves all the risks of empowerment (for example, having the group or class agree to an embarrassingly simplistic or unconvincing position or produce a solution in conflict with the instructor's). Every person, Brufee (1995) holds, belongs to several "interpretative or knowledge communities" that share vocabularies, points of view, histories, values, conventions and interests. The job of the instructor is to help students learn to negotiate the boundaries between the communities they already belong to and the community represented by the teacher's academic discipline, which the students want to join. Every knowledge community has a core of foundational knowledge that its members consider as given (but not necessarily absolute). To function independently within a knowledge community, the fledgling scholar must master enough material to become conversant with the community." Rockwood concludes: "In my teaching experience, cooperative

represents the best means to approach mastery of foundational knowledge. Once students become reasonably conversant, they are ready for collaborative, ready to discuss and assess,...."

Myers suggests use of the "transaction" orientation as a compromise between taking hard positions advocating either methodology. "This orientation views education as a dialogue between the student and the curriculum. Students are viewed as problem solvers. Problem solving and inquiry approaches stressing cognitive skills and the ideas of Vygotsky, Piaget, Kohlberg and Bruner are linked to transaction. This perspective views teaching as a "conversation" in which teachers and students learn together through a process of negotiation with the curriculum to develop a shared view of the world."

Brody and Davidson (1998) look at the differences between the two paradigms epistomologicly. In the early1970s some educators were formulating methods based upon studies of human social interaction and group learning. These studies lead to cooperative learning strategies based upon social interdependence theory, cognitive-developmental theory and the behavioral learning theory. Another group of educators based their framework for group work on theories derived from studies about the social nature of human knowledge. The different roots of constructivism formed the basis of collaborative learning.

Johnson, Johnson, and Smith (1998) clarify the differences between the cooperative learning strategies. "Social interdependence theory assumes that cooperative efforts are based on intrinsic motivation generated by interpersonal factors and a joint aspiration to achieve a significant goal. Behavioral learning theory assumes that cooperative efforts are powered by extrinsic motivation to achieve rewards. Social interdependence theory focuses on relational concepts dealing with what happens among individuals (for example cooperation is something that exists only among individuals not within them), whereas the cognitive-development perspective focuses on what happens within a single person (for example, the disequilibrium, cognitive reorganization). The differences across these theoretical assumptions have yet to be fully explored or solved." (p29)

Brody and Davidson (1998) identify a series of questions for teaching and learning in the classroom which help distinguish between the approaches. (p8)

"Questions teachers ask from the cooperative learning perspective

1. How do we teach social skills?

2. How can we develop self-esteem, responsibility, and respect for others?

3. How does social status effect learning in small groups?

4. How do you promote problem solving and manage conflict?

5. Are extrinsic or intrinsic rewards more effective?

6. How can we prove that cooperative learning increases academic achievement?

7. How do we teach children to take on various roles?

8. How do we structure cooperative activities?

Questions teachers ask from a collaborative perspective

1. What is the purpose of the activity?

2. What is the importance of talk in learning?

3. To what extant is getting off topic a valuable learning experience?

4. How can we empower children to become autonomous learners?

5. What is the difference between using language to learn and learning to use language?

6. How can we negotiate relevant learning experiences with children?

7. How do we interact with students in such a way that we ask only real questions rather than those for which we already know the answers?

8. How can we use our awareness of the social nature of learning to create effective small group learning environments?"

Johnson, Johnson & Holubec (1991) have established a definition of cooperative learning which identifies five basic elements necessary for a procedure to be considered cooperative. They also define structures and evaluation procedures within which any content may be taught, rather than defining procedures based upon specific curriculum. They have developed an extensive set of worksheets for teachers and students to use in establishing the five elements. The Johnson's five items are as follows.

"Positive Interdependence-Students perceive that they need each other to complete the group's task ("sink or swim together"). Teachers may structure positive interdependence by establishing mutual goals (learn and make sure all other group members learn), joint rewards (if all group members achieve above criteria, each will receive bonus points), shared resources (one paper for each group or each member receives part of the information), and

assigned roles (summarizer, encourager of participation, recorder, time keeper etc.).
Face-to- Face Promotive Interaction-Students promote each other's learning by helping, sharing, and encouraging efforts to learn. Students explain, discuss, and teach what they know to classmates. Teachers structure the groups so that students sit knee to knee and talk through each aspect of the assignment.

Individual Accountability- Each student's performance is frequently assessed and the results are given to the group and the individual. Teachers may structure individual accountability by giving an individual test to each student or randomly selecting one member of the group to give the answer.

Interpersonal And Small group Skills- Groups cannot function effectively if students do not have and use the needed social skills. Teachers teach these skills as purposefully and precisely as academic skills. Collaborative skills include leadership, decision making, trust building, communication, and conflict-management skills.

Group Processing- Groups need specific time to discuss how well they are achieving their goals and maintaining effective working relationships among members. Teachers structure group processing by assigning such tasks as (a) list at least three member actions which helped the group be successful and (b) list one action that could be added to make the group more successful tomorrow. Teachers also monitor the groups and give feedback on how well the groups are working together and the class as a whole. (p1:33)

The National Council of Teachers of Math (NCTM) has a similar definition as presented by Alice Artzt and Claire Newman (1990) in their book "How to use cooperative learning in a math class. "Cooperative learning involves a small group of learners, who work together as a team to solve a problem, complete a task, or accomplish a common goal. There are many different cooperative learning techniques; however, all of them have certain elements in common. These elements are the ingredients necessary to insure that when students do work in groups, they work cooperatively. First, the members of a group muct perceive that they are part of a team and that they all have a common goal. Second, group members must realize that the problem they are to solve is a group problem and that the success or failure of the group will be shared by all members of the group. Third, to accomplish the group's goal, all students must talk with

one another- to engage in discussion of all problems. Finally, it must be clear to all that each member's individual work has a direct effect on the group's success. Teamwork is of utmost importance."

Many of the elements of cooperative learning may be used in collaborative situations. For example students work in pairs together in aThink-Pair-Share procedure, where students consider a question individually, discuss their ideas with another student to form a consensus answer, and then share their results with the entire class. The use of pairs can be introduced at any time during a class to address questions or solve problems or to create variety in a class presentation. TheJig Saw method (Aronson 1978) is a good example. Students become "experts" on a concept and are responsible for teaching it to the other group members. Groups subdivide a topic and members work together with those from other groups who have the same topic. They then return to their original groups and explain their topic. Slavin developed the STAD method (Student Teams-Achievement-Divisions) where the teacher presents a lesson, and then the students meet in teams of four or five members to complete a set of worksheets on the lesson. Each student then takes a quiz on the material, and the scores the students contribute to their teams are beased upon the degree to which they have improved their individual past averages. The highest scoring teams are recognized in a weekly class newsletter. In another method developed by Slavin-TGT (Teams-Games-Tournaments) instead of taking quizzes the students play academic games as representatives of their teams. They compete with students having similar achievement levels and coach each other prior to the games to insure all group members are competent in the subject matter. Other structures includeCo-op, Co-op (Kagan), CIRC- Cooperative Integrated Reading and Comparison (Madden, Slavin, Stevens), Group Investigation (Sharan, Aharan), Issues Controversy, Learning Together (Johnson, Johnson), Jigsaw II (Slavin), TAI-Team Assisted Individualization (Slavin, Leavy, Madden), Structured Controversy (Johnson, Johnson).

OPTIONS IN COOPERATIVE LEARNING (Lee 1997)
There are many ways that cooperative learning can be implemented. An educator's philosophy plays a key role in determining how cooperative learning is used. The table below displays a number of issues in education. Following the table, implications of various choices are discussed. Please bear in mind that the choices in the table are not either-or choices. Instead, they represent continua, and the views of educators lie at many different points along these continua. Further, a given educator's views are affected by the students the are currently teaching.

1. student-centered----------teacher-centered

2. intrinsic motivation---------- extrinsic motivation

3. knowledge construction----------knowledge transmission

4. loose, trusting students to do---------- structured,

it right social engineering

Issue 1. Student centered -- Teacher-centered

The issue here is the role of students in shaping the classroom. Student-centered, also called learner-centered, means that students provide input into what the class does and how it does it. This includes decisions about what to study, how to study it (e.g., by reading, field trips, discussion, lecture), choice of group mates, how often to use groups, which group activities to do, how assessment is conducted, and what rewards and punishments - if any - are given.

In a teacher-centered situation the above decisions are made exclusively by the teacher. Teachers are the bosses, leaders, and creators, while students are the employees, followers, and users. The what and how of learning are preplanned by the teacher. When students are in groups, they are studying material chosen by the teacher. The teacher decides who is in which group, gives groups time limits for finishing their tasks, and does all the assessment.

Issue 2. Intrinsic motivation - Extrinsic motivation The issue here is how students become motivated to learn and cooperate. Intrinsic motivation comes from within students. For example, they want to learn for the joy of learning, because they are very interested in the topic, or to improve themselves. Helping other students flows from the desire to be altruistic and the enjoyment of collective effort. Students learn together without the use of grades, team award certificates, and other rewards or punishments to encourage them.

On the other hand, extrinsic motivation comes from outside the students. For example, they learn in order to receive praise, grades or other rewards from teachers, parents, classmates, and others. They may not help one another learn if there are no outside incentives. When rewards or threats of punishment are not there, students may be less eager to learn and to help one another.

Issue 3. Knowledge construction - Knowledge transmission

This issue involves the process by which students learn. Knowledge construction, a concept from cognitive psychology, is the idea that learners construct their own networks of knowledge by connecting new information with their past knowledge and interests. Each person is different; we each will come away from the same lesson with different constructions of the ideas presented. Teachers can facilitate this construction work, but the key is what happens in each individual's mind. The use of open-ended questions is consistent with knowledge construction. In this view, collaborative interaction in groups provides students with many opportunities to build and try out their developing knowledge.

Knowledge transmission, a concept from behaviorist psychology, sees knowledge flowing directly from the teacher to the student, just like the teacher is pouring

knowledge into the students' heads. What the teacher teaches should go into each learner's head without being filtered by what is already there. Close-ended questions tend to predominate in this type of instruction. The main role of groups from this perspective is to make sure group members master the material transmitted by the teacher.

Issue 4. Loose -- Structured

This issue refers to the extent which teachers believe groups of students will work together well without teacher intervention. Teachers may start by using more structure and as students become familiar with the group process and proficient at working together they eventually, may be looser about structuring group activities and teaching collaborative skills in order to encourage effective group interaction. On the other hand, other teachers feel that they need to be like social engineers, structuring group interaction, or else students will not reap the benefits of working together. The issues discussed above are also heard when some people contrast the terms "collaborative learning" and "cooperative learning". At the same time, it should be pointed out that other educators use the two terms interchangeably.

Collaborative Learning (Orr 1997)

Frequently, when students or teachers hear the phrase collaborative learning, they automatically assume a work group context, harken back to their own unpleasant experiences with work or study groups, and dismiss the notion of collaboration as an unworkable approach that attempts to transfer the burden of teaching from teacher to student. Such anxiety is worth noting because it represents an acute misunderstanding of what has become a most viable approach to teaching and learning.

Collaborative learning is based upon the following principles:

1. Working together results in a greater understanding than would likely have occurred if one had worked independently.

2. Spoken and written interactions contribute to this increased understanding.

3. Opportunity exists to become aware, through classroom experiences,of relationships between social interactions and increasedunderstanding.

4. Some elements of this increased understanding are idiosyncratic and unpredictable.

5. Participation is voluntary and must be freely entered into.

Cooperative Learning is very similar except that it introduces a more structured setting with the teacher in total control of the learning environment. Interactive learning relies on the application of computer technology as the collaborative medium between student and teacher. But all three learning approaches recognize that learning is indeed a two-way street with teaching and learning being two components of the same educational system. The approaches diverge in the amount of freedom allowed

the participants; collaborative learning strategies are the most open.

In my classes, I view student-teacher and student-student collaboration as essential to successful learning. Thus, I will seek every opportunity to encourage collaborative experiences. This does not imply that there will be no traditional lecture formats. Some lecturing is necessary either to clarify complex informational ideas or to present material not readily available. But students will experience a variety of instructional methods and they will be actively involved in the learning experience

REFERENCES

Artzt, A.F., Newman, C.M., (1990)How To Use Cooperative learning in the Mathematics Class, National Council of Teachers of mathematics: Reston, VA

Brody, C.M., (1995), "Collaboration or cooperative learning? Complimentary practices for instructional reform", The Journal of Staff, Program & Organizational Development v12, n3, Winter 1995, p133-143

Brody, C.M., & Davidson, N., (1998), "Introduction: Professional development and Cooperative learning" in Brody and Davidson (Eds.), Professional Development for Cooperative Learning- Issues and Approaches, State University of NY Press; Albany NY

Bruffee, K., (1995), "Sharing our toys- Cooperative learning versus collaborative learning". Change, Jan/Feb, 1995 pp12-18

Johnson, D.W., Johnson, R.T., Holubec, E.J., Cooperation in The Classroom, (1991), Interaction Book Co: Edina, MN

Johnson, D.W., Johnson, R.T., Smith, K.A., (1998),Change, July/August p27-35

_____, (1991), Active Learning: Cooperation in the College Classroom Interaction Book Co.: Edina, MN

Kagan, S., Educational Leadership (Dec/Jan 1989/1990)

Lee, G.S., Internet communication, Institute for Distance Education

Universiti Pertanian Malaysia

Myers, M , (1991), Cooperative Learning vol 11 #4, July

Orr R., Internet communication, IUPUI Professor of Computer Technology

Rockwood, R., National Teaching and Learning Forum vol 4 #6, 1995 part 1